

Gesture and Speech as Autonomous Communicating Processes

Hannes Rieser, CRC "Alignment in Communication", Bielefeld University

Gesture and speech work on different communicative channels and define signs in different ways. This is, e.g., reflected in how structures can be extracted out of them, say, by parsing procedures: Interpretation of speech is based on syntax, interpretation of gesture on rated annotation.

It goes without saying that the descriptively oriented gesture research of Kendon (2004), McNeill (1992, 2005) and followers greatly enhanced our understanding of the speech-gesture relation. However, unnoticed by the main-stream gesture research there has been a substantial amount of work on the speech-gesture relation using formal grammars, logics, semantics and paradigms based on these worth to be seriously considered. There were accounts making use of Finite State Grammar, Unification-based Grammar, LTAG, Montague Grammar, HPSG, PTT, and SDRT (cf. the overview in Rieser (2013)). Despite differences neglected here, the solution in these accounts is to define a formally specified interface where speech and gesture information interact. Empirical observations informing such interfaces are: gesture stroke is well defined and the only carrier of gesture meaning, speech and gesture overlap marks the interface area, speech meaning is overriding, gesture meaning is non-autonomous and its integration is bounded by syntactic constituents. The assumption that integration of gesture meaning and speech meaning is organized at the level of semantics or pragmatics tends to blur the difference between information coming from speech and information coming from gesture.

Admittedly, accounts based on these assumptions can describe a fair portion of standard speech-gesture occurrences. However, they are crucially limited. A substantial amount of speech-gesture data cannot be modelled if one subscribes to methodological principles sticking to the observations mentioned above. Among these data are non-synchrony cases of speech and matching gesture, the fact that gesture meaning and speech meaning may contradict each other or that gesture information is bound to post-holds of various sorts, for example, indicating an object held. Even more crucial data are: a gesture may contribute information to different sub-word structures in a sequence of words or overlap constructions of different sorts (Hahn and Rieser (2012)). These findings together inform a novel interface conception: speech and gesture have to be taken as autonomous processes or agents working in parallel towards a cooperative multi-modal solution. As a consequence, the interface is not provided by a pre-existing static structure, say, a CFG, an AVM or a more intricate object (Röpke, Hahn, Rieser (2013)) into which speech and gesture feed information. Instead, we have a communicative exchange established by the autonomous speech and gesture processes. In the talk, types of speech-gesture communication such as preceding or delayed gesture productions will be delineated. Formal models from Concurrent Programming will be suggested which can partially describe these. The hope is that this is the adequate mechanism to handle parallel information such as speech and gesture information, speech and supra-segmental information or speech and eye-gaze information.

Acknowledgements: Thanks go to my colleagues Insa Lawler and Florian Hahn for discussion of speech-gesture issues during recent years.

Bibliography

Hahn, F. and Rieser, H. (2012). Non-compositional Gestures. *Talk given at ESSLLI 2012.*

- Johnston, M. *et al.* (1997). Unification-based multimodal integration. In *Proceedings of the Eighth Conference on European Chapter of the Association for Computational Linguistics*, pp. 281-288, Madrid. ACL.
- Kendon, A. (2004). *Gesture: Visible Action as Utterance*. Cambridge: CUP.
- McNeill, D. (1992). *Hand and Mind: What Gestures Reveal about Thought*. Chicago: Chicago University Press.
- McNeill, D. (2005). *Gesture and Thought*. Chicago: Chicago University Press.
- Rieser, H. (2013). Speech-gesture interfaces. An overview. In *Abstracts of the 35th Annual Conference of the German Linguistic Society (DGfS)*, pp. 282-283.
- Röpke, I., Hahn, F., and Rieser, H. (2013). Interface Constructions for Gestures Accompanying Verb Phrases. *Abstracts of the 35th Annual Conference of the German Linguistic Society (DGfS)*, Potsdam, pp. 295-296.